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Lake Pleasant, Maricopa and Yavapai Counties, Arizona

National Eutrophication Survey, Las Vegas, Nev

Prepared for

Environmental Monitoring and Support Lab, Las Vegas, Nev

Aug 77

PB 281 402

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NATIONAL EUTROPHICATION SURVEY

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and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

LAKE PLEASANT

MARICOPA AND YAVAPAI COUNTIES

ARIZONA

EPA REGION IX

WORKING PAPER No. 732

WITH THE COOPERATION OF THE

ARIZONA STATE DEPARTMENT OF HEALTH

AND THE

ARIZONA NATIONAL GUARD

AUGUST, 1977

REPORT ON LAKE PLEASANT

MARICOPA AND YAVAPAI COUNTIES, ARIZONA

EPA REGION IX

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 732

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

August 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Arizona State Department of Health for professional involvement, to the Arizona National Guard for conducting the tributary sampling phase of the Survey, and to those Arizona wastewater treatment plant operators who provided effluent samples and flow data.

The staffs of the Bureau of Water Quality Control, Environmental Health Services, Arizona State Department of Health, and the Arizona Game and Fish Department, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

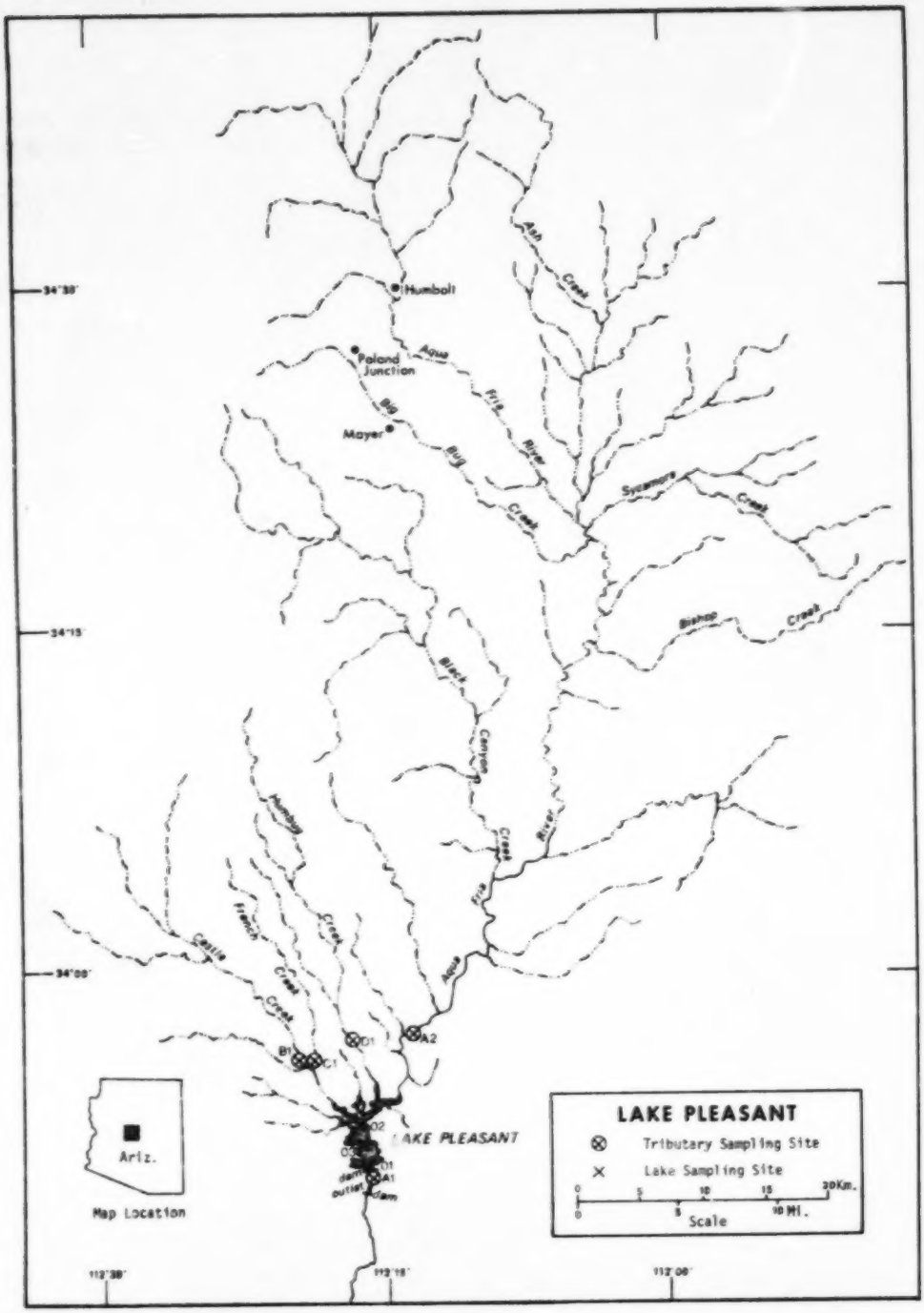
Major General John G. Smith, the Adjutant General of Arizona, and Project Officer Colonel Richard A. Colson, who directed the volunteer efforts of the Arizona National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ARIZONA

LAKE NAME	COUNTY
Big Lake	Apache
Fools Hollow Lake	Navajo
Lake Havasu	Mohave (San Bernadino in CA)
Luna Lake	Apache
Lyman Lake	Apache
Lake Mohave	Mohave (Clark in NV)
Lake Pleasant	Yavapai, Maricopa
Lake Powell	Coconino (Kane, Garfield, San Juan in UT)
Rainbow Lake	Navajo
Theodore Roosevelt Lake	Gila
San Carlos Reservoir	Graham, Gila, Pinal


Humboldt
Poland Junction
Mayer
Agua Fria River
Big Bug Creek
Sycamore Creek
Bishop Creek
Black Canyon Creek
Humbug Creek
Castle Creek
French Creek
Agua Fria
34°30'
34°15'
34°00'
112°30'
112°15'
112°00'
B1
C1
D1
A2
D2
C2
D3
A1
dam outlet
dam
LAKE PLEASANT
Ariz.
Map Location
LAKE PLEASANT
Tributary Sampling Site
Lake Sampling Site
0 5 10 15 20Km.
0 5 10 Mi.
Scale

REPORT ON LAKE PLEASANT, ARIZONA

STORET NO. 0407

I. INTRODUCTION

Lake Pleasant was included in the National Eutrophication Survey as a water body of interest to the Arizona State Department of Health. During the sampling year, tributaries A-2, B-1, C-1 and D-1 were dry at the sample collection times and no water samples could be taken. For this reason, a nutrient budget for Lake Pleasant based upon annual tributary loadings cannot be determined. The normalized flow data for tributaries A-1 and A-2 and monthly chemistry data for tributary A-1 are included for the record in Appendices B and D, respectively, in this report.

Although no nutrient budget for this lake was calculated, it should be noted that there are no known point sources to the lake, and thus all nutrient loading to the watershed is produced by diffuse nonpoint contributions such as desert runoff and grazing activities.

II. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Lake Pleasant is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial

*See Appendix E.

or deleterious is determined by its actual or potential impact upon designated beneficial water uses of each lake.

Chlorophyll a values in the lake ranged from 3.2 µg/l to 37.0 µg/l, with a mean of 9.8 µg/l. Potential for primary productivity as measured by algal assay control yields was moderately low in March and high in November. Secchi disc visibility was low. Of the 11 Arizona lakes sampled in 1975, 6 had higher median orthophosphorus levels (0.027 mg/l), 9 had higher median inorganic nitrogen values (0.040 mg/l), and all had higher median orthophosphorus levels (0.004 mg/l) than Lake Pleasant.

During March sampling, survey limnologists noted floating mats of red algae concentrated in the northeast arm of the lake.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Lake Pleasant was limited by available phosphorus during both sample collection times (03/05/75, 11/17/75). Lake data suggest primary limitation by nitrogen in the summer and phosphorus limitation in the spring and autumn.

III. LAKE CHARACTERISTICS*

A. Lake Morphometry:**

1. Surface area: 14.16 km^2.†
2. Mean depth: 13.7 meters.
3. Maximum depth: 51.8 meters.
4. Volume: 194.275 x 10^6 m^3.††

B. Precipitation:

1. Year of sampling: 11.4 cm.
2. Mean annual: 17.9 cm.

*A table of metric/English conversions is included as Appendix A.
**Rathburn, 1974.
†Average value.
††Maximum value.

IV. LAKE WATER QUALITY SUMMARY

Lake Pleasant was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake (additional quality control samples were taken in March at Stations 01 and 02) and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 18.6 meters at Station 01, 7.6 meters at Station 02, and 13.7 meters at Station 03. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in IV-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in IV-B. Results of the limiting nutrient study are presented in IV-C.

CODE 0407

A. PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(3/ 5/75) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(6/17/75) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(11/17/75) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	14	9.6- 12.7	11.4	0.0- 1.5	6	21.8- 24.4	23.2	0.0- 1.5	5	13.0- 13.6	13.2	0.0- 1.5
MAX DEPTH**	3	7.7- 8.5	8.2	7.6- 18.6	3	13.4- 24.2	14.9	4.6- 14.0	3	12.8- 13.6	12.9	0.0- 9.8
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	13	10.0- 11.0	10.6	0.0- 1.5	6	5.4- 7.6	6.8	0.0- 1.5	5	7.6- 8.8	8.2	0.0- 1.5
MAX DEPTH**	3	7.0- 7.6	7.2	7.6- 18.6	3	0.3- 7.2	7.0	4.6- 14.0	3	8.0- 8.6	8.0	0.0- 9.8
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	14	475.- 505.	490.	0.0- 1.5	6	590.- 642.	615.	0.0- 1.5	5	402.- 418.	411.	0.0- 1.5
MAX DEPTH**	3	491.- 497.	493.	7.6- 18.6	3	498.- 640.	527.	4.6- 14.0	3	406.- 417.	411.	0.0- 9.8
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	14	8.3- 8.5	8.5	0.0- 1.5	6	7.9- 8.4	8.3	0.0- 1.5	5	8.2- 8.3	8.3	0.0- 1.5
MAX DEPTH**	3	8.0- 8.1	8.0	7.6- 18.6	3	8.3- 8.5	8.4	4.6- 14.0	3	8.2- 8.2	8.2	0.0- 9.8
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	14	166.- 178.	171.	0.0- 1.5	6	173.- 176.	174.	0.0- 1.5	5	181.- 189.	187.	0.0- 1.5
MAX DEPTH**	3	170.- 177.	174.	7.6- 18.6	3	172.- 182.	177.	4.6- 14.0	3	181.- 187.	187.	0.0- 9.8
TOTAL P (MG/L)												
0.-1.5 M DEPTH	14	0.016-0.041	0.025	0.0- 1.5	6	0.025-0.038	0.028	0.0- 1.5	5	0.036-0.086	0.054	0.0- 1.5
MAX DEPTH**	3	0.017-0.036	0.023	7.6- 18.6	3	0.026-0.038	0.037	4.6- 14.0	3	0.039-0.086	0.044	0.0- 9.8
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	14	0.002-0.003	0.004	0.0- 1.5	6	0.011-0.027	0.016	0.0- 1.5	5	0.002-0.012	0.008	0.0- 1.5
MAX DEPTH**	3	0.002-0.003	0.003	7.6- 18.6	3	0.003-0.020	0.005	4.6- 14.0	3	0.002-0.008	0.004	0.0- 9.8
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	14	0.020-0.020	0.020	0.0- 1.5	6	0.020-0.030	0.020	0.0- 1.5	5	0.060-0.080	0.070	0.0- 1.5
MAX DEPTH**	3	0.020-0.020	0.020	7.6- 18.6	3	0.020-0.020	0.020	4.6- 14.0	3	0.060-0.080	0.080	0.0- 9.8
AMMONIA (MG/L)												
0.-1.5 M DEPTH	14	0.020-0.060	0.020	0.0- 1.5	6	0.030-0.050	0.040	0.0- 1.5	5	0.030-0.060	0.060	0.0- 1.5
MAX DEPTH**	3	0.020-0.020	0.020	7.6- 18.6	3	0.040-0.110	0.040	4.6- 14.0	3	0.030-0.060	0.040	0.0- 9.8
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	14	0.400-1.000	0.600	0.0- 1.5	6	0.500-1.000	0.650	0.0- 1.5	5	0.400-0.600	0.400	0.0- 1.5
MAX DEPTH**	3	0.300-0.400	0.400	7.6- 18.6	3	0.400-0.500	0.500	4.6- 14.0	3	0.400-0.400	0.400	0.0- 9.8
SECCHI DISC (METERS)	7	1.2- 1.7	1.5		3	1.7- 2.1	2.1		3	0.3- 0.3	0.3	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

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B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units Per ml
03/05/75	1. Peridinium	540
	2. Ankistrodesmus	295
	3. Chroomonas?	147
	4. Cryptomonas	98
	5. Melosira	98
	Other genera	198
	Total	1,376
06/17/75	1. Centric diatom	804
	2. Tetraedron	739
	3. Melosira	565
	4. Dactylococcopsis	544
	5. Crucigenia	261
	Other genera	1,239
	Total	4,152
11/15/75	1. Dactylococcopsis	1,518
	2. Tetrastrum	875
	3. Melosira	875
	4. Nitzschia	669
	5. Crucigenia	437
	Other genera	3,188
	Total	7,562

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
03/05/75	01	4.0 (7.6, 8.8)*
	02	16.4 (11.2, 16.9)*
	03	7.5
06/17/75	01	7.5
	02	3.8
	03	4.6
11/16/75	01	3.3
	02	37.0
	03	3.2

*Additional samples taken for quality control checks.

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. 03/05/75

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum Yield (mg/l-dry wt.)
Control	0.005	0.064	0.4
0.05 P	0.055	0.064	4.2
0.05 P + 1.0 N	0.055	1.064	20.0
1.00 N	0.005	1.064	0.4

b. 11/17/75

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum Yield (mg/l-dry wt.)
Control	0.020	0.220	1.5
0.05 P	0.070	0.220	9.0
0.05 P + 1.0 N	0.070	1.220	18.8
1.00 N	0.020	1.220	1.2

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum*, indicate that the potential for primary productivity in Lake Pleasant was moderately low during the spring sample collection time (03/05/75) and high during fall sampling (11/17/75). In both samples the increase in growth produced beyond that of the control in response to the addition of phosphorus as well as the lack of response to the addition of nitrogen, indicates phosphorus limitation. Maximum yield was achieved by the simultaneous addition of both phosphorus and nitrogen.

The mean inorganic nitrogen to orthophosphorus ratios (N/P) in the lake data of 14/1 and 20/1 in the spring and fall, respectively, suggest primary limitation by phosphorus during those sampling periods. The N/P ratio of 4/1 during summer sampling suggest nitrogen limitation at that time.

*For further information regarding the algal assay test procedure and selection of test organisms, see U.S. EPA (1971).

V. LITERATURE REVIEWED

Rathbun, Ned L. 1974. Personal Communication (lake morphometry). Arizona Game and Fish Department, Phoenix, Arizona.

U.S. Environmental Protection Agency. 1971. Algal Assay Procedure Bottle Test. National Eutrophication Research Program, Corvallis, Oregon.

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. National Environmental Research Center, Las Vegas, Nevada, and Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon.

VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR ARIZONA 11/26/76

LAKE CODE 0407 LAKE PLEASANT

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 3778.8

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
0407A1	3778.8	0.142	0.708	1.699	1.416	1.133	2.124	3.681	3.964	2.407	0.142	0.028	0.028	1.462
0407A2	2926.7	1.133	2.549	3.398	1.133	0.425	0.425	0.566	1.133	1.699	0.0	0.0	5.663	1.509
0407Z7	852.1	0.57	0.28	0.28	0.28	0.28	0.14	0.23	0.42	0.42	0.28	0.14	1.13	0.37

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 3778.8
SUM OF SUB-DRAINAGE AREAS = 3778.8

TOTAL FLOW IN = 22.60
TOTAL FLOW OUT = 17.47

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
0407A1	12	74	0.0	7	0.0				
	1	75	0.0	11	0.0				
	2	75	0.0	15	0.0				
	3	75	1.410	17	1.416				
	4	75	2.642	12	2.492	30	3.002		
	5	75	2.192	10	2.152	30	2.067		
	6	75	2.084	14	1.869				
	7	75	2.639	8	1.954				
	8	75	3.228	4	3.171				
	9	75	1.736	10	3.341				
	10	75	0.0	20	0.0				
	11	75	0.0	13	0.0				
0407A2	12	74	0.031	7	0.0	7	0.037		
	1	75	0.024	11	0.0	11	0.027		
	2	75	0.024	15	0.0	15	0.024		
	3	75	0.031	17	0.0	17	0.027		
	4	75	0.192	12	0.0	12	0.062		
	4	75	0.0	30	0.0	30	0.024		
	5	75	0.017	10	0.0	10	0.022		
	5	75	0.0	30	0.0	30	0.012		
	6	75	0.008	14	0.0	14	0.007		
	7	75	0.382	8	0.0	8	0.009		
	8	75	0.010	4	0.0	4	0.014		
	9	75	0.012	10	0.0	10	0.006		
	10	75	0.006	20	0.0	20	0.007		
	11	75	0.006	13	0.0	13	0.005		

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LAKE CODE 0407 LAKE PLEASANT

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
0407ZZ	12	74	0.014						
	1	75	0.028						
	2	75	0.042						
	3	75	0.057						
	4	75	0.113						
	5	75	0.057						
	6	75	0.057						
	7	75	0.283						
	8	75	0.057						
	9	75	0.057						
	10	75	0.028						
	11	75	0.028						

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/11/20
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

040701
33 51 25.0 112 16 15.0 3
LAKE PLEASANT
04013 ARIZONA

110491

FEMALES 2111202
0064 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/03/05	09	30 0000	11.3	10.4	66	492	8.30	166	0.020	1.000	0.020K	0.004
	09	30 0005	11.4	10.2		492	8.35	171	0.020	0.500	0.020	0.009
	09	30 0020	11.2	8.0		488	8.40	166	0.020	0.400	0.040	0.006
	09	30 0030	11.0	10.0		493	8.35	169	0.030	0.400	0.020	0.005
	09	30 0045	9.6	8.2		489	8.10	170	0.020	0.400	0.020K	0.004
	09	30 0060	9.4	11.4		483	8.00	168	0.040	0.700	0.020K	0.008
	15	10 0000	11.8	10.8	60	499	8.50	166	0.020	0.500	0.020K	0.003
	15	10 0005	11.6	10.6		490	8.50	166	0.020	0.400	0.020K	0.008
	15	10 0015	11.3	10.4		497	8.50	168	0.020K	0.400	0.020K	0.004
	15	10 0025	10.9	9.2		487	8.30	169	0.020K	0.400	0.020K	0.003
	15	10 0040	9.6	7.0		490	8.10	169	0.020K	0.300	0.020K	0.003
	15	10 0050	9.5	7.8		495	8.10	169	0.020K	0.800	0.020K	0.003
	15	10 0060	9.4	8.6		488	8.40	169	0.020K	0.300	0.020K	0.002
	15	50 0000	10.1	10.4	60	475	8.50	177	0.020	0.500	0.020K	0.004
	15	50 0005	9.8	10.4		486	8.50	177	0.020K	0.400	0.020K	0.003
	15	50 0015	9.6	10.8		489	8.50	176	0.030	0.400	0.020	0.004
	15	50 0030	8.7	8.8		492	8.30	176	0.020	0.300	0.020	0.003
	15	50 0045	7.9	8.0		492	8.15	175	0.020K	0.300	0.020K	0.002
	15	50 0061	7.7	7.6		493	8.10	176	0.020	0.300	0.020K	0.003
75/06/17	14	25 0000	22.6	7.2	84	605	8.30	174	0.050	0.700	0.020K	0.026
	14	25 0005	21.8	5.4		590	7.95	173	0.040	0.500	0.020K	0.027
	14	25 0015	18.6	6.0		559	7.80	177	0.040	0.500	0.020K	0.027
	14	25 0030	15.3	0.1		514	7.50	182	0.180	0.500	0.020	0.040
	14	25 0046	13.4	7.0		498	8.30	172	0.040	0.400	0.020K	0.005
75/11/17	15	30 0000	13.2	8.2	12	409	8.35	187	0.060	0.500	0.080	0.007
	15	30 0005	13.0	8.0		402	8.25	189	0.060	0.600	0.080	0.006
	15	30 0015	13.0	8.0		396	8.20	190	0.060	0.400	0.080	0.006
	15	30 0032	12.8	8.0		406	8.20	187	0.040	0.400	0.080	0.004

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 75/11/26
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

040701
33 51 25.0 112 16 15.0 3
LAKE PLEASANT
04013 ARIZONA

110491

11EPALES 2111202
0054 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/03/05	09 30	0000	0.031	4.0	
	09 30	0005	0.019		
	09 30	0020	0.019		
	09 30	0030	0.019		
	09 30	0045	0.033		
	09 30	0060	0.146		
	15 10	0000	0.028	7.6	
	15 10	0005	0.021		
	15 10	0015	0.020		
	15 10	0025	0.023		
	15 10	0040	0.023		
	15 10	0050	0.708		
	15 10	0060	0.029		
	15 50	0000	0.020	8.8	
	15 50	0005	0.016		
	15 50	0015	0.020		
	15 50	0030	0.016		
	15 50	0045	0.016		
	15 50	0061	0.017		
75/06/17	14 25	0000	0.029	3.8	
	14 25	0005	0.027		
	14 25	0015	0.028		
	14 25	0030	0.060		
	14 25	0046	0.026		
75/11/17	15 30	0000	0.048	3.3	
	15 30	0005	0.036		
	15 30	0015	0.042		
	15 30	0032	0.039		

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STORET RETRIEVAL DATE 75/11/26
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

040702
33 53 27.0 112 16 38.0 3
LAKE PLEASANT
0402S ARIZONA

110491

11EPALES 2111202
0028 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/03/04	14	35 0000	12.7	10.6	51	497	8.50	170	0.020	1.000	0.020K	0.006
	14	35 0005	11.5	10.6		486	8.50	168	0.020K	0.600	0.020K	0.004
	14	35 0015	10.6	6.4		493	8.00	166	0.020	1.000	0.020K	0.005
	14	35 0023	9.8	6.6		489	8.30	167	0.020	0.600	0.020	0.004
75/03/05	10	30 0000	12.2	10.6	50	488	8.45	172	0.020K	0.700	0.020K	0.004
	10	30 0005	11.2	10.0		490	8.40	170	0.020K	0.600	0.020K	0.003
	10	30 0015	10.7	9.8		492	8.35	170	0.020	0.500	0.020K	0.003
	10	30 0024	10.2	8.2		495	8.20	170	0.020K	0.500	0.020K	0.003
	15	05 0000	10.3	11.0	48	505	8.50	178	0.060	1.000	0.020	0.005
	15	05 0005	10.6	11.0		490	8.50	176	0.020K	0.400	0.020K	0.004
	15	05 0015	9.0	9.4		486	8.35	176	0.020K	0.400	0.020K	0.003
	15	05 0025	8.2	7.2		497	8.00	177	0.020K	0.400	0.020K	0.003
75/06/17	13	40 0000	24.4	6.8	66	642	8.30	176	0.050	1.000	0.030	0.020
	13	40 0005	24.4	7.6		640	8.40	176	0.030	0.600	0.020K	0.012
	13	40 0015	24.2	7.2		640	8.40	177	0.040	0.500	0.020K	0.003
75/11/16	14	50 0000	13.6	8.6	10	411	8.20	181	0.030	0.400	0.060	0.002

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/03/04	14	35 0000	0.041	16.4	
	14	35 0005	0.027		
	14	35 0015	1.230		
	14	35 0023	0.037		
75/03/05	10	30 0000	0.023	11.2	
	10	30 0005	0.023		
	10	30 0015	0.022		
	10	30 0024	0.027		
	15	05 0000	0.030	16.9	
	15	05 0005	0.027		
	15	05 0015	0.030		
	15	05 0025	0.036		
75/06/17	13	40 0000	0.038	4.6	
	13	40 0005	0.031		
	13	40 0015	0.038		
75/11/16	14	50 0000	0.086	37.0	

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 75/11/25
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

040703
33 52 34.0 112 16 25.0 3
LAKE PLEASANT
04013 ARIZONA

110491

11EMALES 2111202
0050 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/03/05	11 25	0000	11.8	10.6	60	491	8.40	172	0.020K	0.500	0.020K	0.003
	11 25	0005	11.5			494	8.40	171	0.020K	0.500	0.020K	0.002
	11 25	0015	11.4	4.2		492	8.40	169	0.020K	0.400	0.020K	0.002
	11 25	0025	10.4	4.2		486	8.30	167	0.020K	0.400	0.020K	0.002
	11 25	0035	9.7	8.0		498	8.05	169	0.020K	0.400	0.020K	0.003
	11 25	0045	9.5	7.0		491	8.00	170	0.020K	0.400	0.020K	0.002
75/06/17	14 10	0000	23.2	6.8	84	612	8.40	173	0.040	0.800	0.020K	0.011
	14 10	0005	23.2	6.6		617	8.40	173	0.030	0.600	0.020K	0.011
	14 10	0015	22.7	6.0		611	8.30	174	0.030	0.500	0.020K	0.013
	14 10	0035	14.9	0.3		527	8.50	182	0.110	0.500	0.020K	0.020
75/11/17	15 10	0000	13.3	8.8	10	418	8.25	184	0.050	0.400	0.070	0.009
	15 10	0005	13.0	7.6		412	8.20	187	0.060	0.400	0.070	0.012
	15 10	0014	12.9	8.0		417	8.20	187	0.060	0.400	0.080	0.008

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/03/05	11 25	0000	0.032	7.5	
	11 25	0005	0.023		
	11 25	0015	0.020		
	11 25	0025	0.022		
	11 25	0035	0.025		
	11 25	0045	0.023		
75/06/17	14 10	0000	0.027	3.2	
	14 10	0005	0.025		
	14 10	0015	0.027		
	14 10	0035	0.037		
75/11/17	15 10	0000	0.059	3.2	
	15 10	0005	0.054		
	15 10	0014	0.044		

K VALUE KNOWN TO BE LESS THAN INDICATED

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APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/11/30
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

0407A1
33 51 10.0 112 16 05.0 4
AGUA FRIA RIVER
04 7.5 HALOY MTN
O/LAKE PLEASANT 110491
BELO WADDELL DAM 1.1 M N LK PLEASANT INN
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	15	20	0.064	0.750	0.020	0.045	0.080
75/01/11	11	00	0.008	0.600	0.016	0.020	0.070
75/02/15	10	10	0.048	1.000	0.008	0.040	0.100
75/03/17	10	00	0.006	1.600	0.015	0.010	0.030
75/04/12	09	20	0.005	0.900	0.025	0.025	0.070
75/04/30	11	10	0.010	2.400	0.030	0.005K	0.040
75/05/10	14	30	0.005	0.600	0.020	0.010	0.030
75/05/30	10	40	0.020	0.500	0.087	0.045	0.050
75/06/14	14	30	0.010	0.750	0.165	0.055	0.070
75/07/08	14	15	0.010	0.850	0.055	0.050	0.080
75/08/04	12	15	0.005	0.650	0.055	0.015	0.060
75/09/10	09	20	0.010	0.900	0.015	0.015	0.070
75/10/20	10	28	0.110	0.200	0.175	0.080	0.120
75/11/13	11	10	0.035	0.600	0.005K	0.075	0.090

K VALUE KNOWN TO BE LESS THAN INDICATED

NATIONAL EUTROPHICATION SURVEY ENVIRONMENTAL PROTECTION AGENCY

APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1975

STATE OF ARIZONA

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of Arizona lakes sampled are presented to allow direct comparison of the ranking, by parameter, of each lake relative to the others. Median total phosphorus, median inorganic nitrogen and median dissolved orthophosphorus levels are expressed in mg/l. Chlorophyll a values are expressed in µg/l. To maintain consistent rank order with the preceding parameters, the mean Secchi disc depth, in inches, is subtracted from 500. Similarly, minimum dissolved oxygen values are subtracted from 15 to create table entries.

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
0401	BIG LAKE	0.032	0.090	386.000	2.900	9.000	0.007
0402	FOOLS HOLLOW	0.059	0.090	466.600	10.683	14.800	0.014
0403	LAKE HAVASU	0.015	0.170	420.231	3.948	10.800	0.005
0404	LUNA LAKE	0.182	0.050	396.250	3.400	12.200	0.131
0405	LYMAN LAKE	0.099	0.060	484.667	2.633	9.000	0.056
0406	LAKE MOHAVE	0.017	0.240	369.667	4.404	8.600	0.010
0407	LAKE PLEASANT	0.027	0.040	449.154	9.808	14.900	0.004
0408	LAKE POWELL	0.009	0.400	239.000	1.333	12.200	0.010
0409	RAINBOW LAKE	0.046	0.045	440.750	16.367	12.000	0.009
0410	ROOSEVELT LAKE	0.020	0.040	429.917	4.073	14.000	0.008
0411	SAN CARLOS RESERVOIR	0.056	0.060	474.500	14.750	14.600	0.009
3201	LAKE MEAD	0.020	0.505	453.600	1.150	8.000	0.007

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
0401	BIG LAKE	45 (5)	41 (4)	82 (9)	73 (8)	77 (8)	73 (8)
0402	FOOLS HOLLOW	18 (2)	41 (4)	18 (2)	18 (2)	9 (1)	18 (2)
0403	LAKE HAVASU	91 (10)	27 (3)	64 (7)	55 (6)	64 (7)	91 (10)
0404	LUNA LAKE	0 (0)	73 (8)	73 (8)	64 (7)	41 (4)	0 (0)
0405	LYMAN LAKE	9 (1)	64 (7)	0 (0)	82 (9)	77 (8)	9 (1)
0406	LAKE MOHAVE	82 (9)	18 (2)	91 (10)	36 (4)	91 (10)	32 (3)
0407	LAKE PLEASANT	55 (6)	95 (10)	36 (4)	27 (3)	0 (0)	100 (11)
0408	LAKE POWELL	100 (11)	9 (1)	100 (11)	91 (10)	41 (4)	32 (3)
0409	RAINBOW LAKE	36 (4)	82 (9)	45 (5)	0 (0)	55 (6)	45 (5)
0410	ROOSEVELT LAKE	68 (7)	95 (10)	55 (6)	45 (5)	27 (3)	64 (7)
0411	SAN CARLOS RESERVOIR	27 (3)	55 (6)	9 (1)	9 (1)	18 (2)	55 (6)
3201	LAKE MEAD	68 (7)	0 (0)	27 (3)	100 (11)	100 (11)	82 (9)